

## Instructions

# Modbus TCP Card

(WSIQ-COM-TCPIP)

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## Product Compatibility

The Modbus TCP Card is suitable for use with WSB and WSIQ soft starters.

## Disclaimer

The examples and diagrams in this manual are included solely for illustrative purposes. The information contained in this manual is subject to change at any time and without prior notice. In no event will responsibility or liability be accepted for direct, indirect or consequential damages resulting from the use or application of this equipment.

## 1 Warnings

**WARNING**

For your safety, isolate the soft starter from mains voltage before attaching or removing accessories.

**WARNING**

Inserting foreign objects or touching the inside of the starter while the expansion port cover is open may endanger personnel, and can damage the starter.

## 2 Important User Information

### 2.1 Safety

Observe all necessary safety precautions when controlling the soft starter remotely. Alert personnel that machinery may start without warning.

It is the installer's responsibility to follow all instructions in this manual and to follow correct electrical practice.

Close attention is required to the electrical installation and the system design to avoid hazards either in normal operation or in the event of equipment malfunction. System design, installation, commissioning and maintenance must be carried out by personnel who have the necessary training and experience. They must read this safety information and this guide carefully.

### 2.2 Product Design

The Modbus TCP Card allows a WorldWide Electric soft starter to connect to an Ethernet network and be controlled or monitored using an Ethernet communication model.

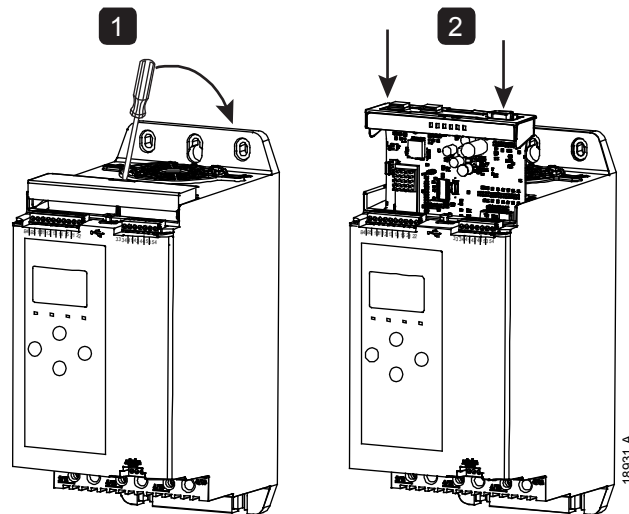
The Modbus TCP Card operates at the application layer.

Familiarity with Ethernet protocols and networks is required to operate the Modbus TCP Card successfully. For difficulties using this device with third party products, including PLCs, scanners and commissioning tools, contact the relevant supplier.

## 3 Installation

### 3.1 Installation Procedure

1. Push a small flat-bladed screwdriver into the slot in the centre of the expansion port cover, and ease the cover away from the starter.
2. Line up the card with the expansion port. Gently push the card along the guide rails until it clicks into the starter.



### 3.2 Network Connection

#### Ethernet Ports

The Modbus TCP Card has two Ethernet ports. If only one connection is required, either port can be used.

#### Cables

Use Category 5, 5e, 6 or 6e cable to connect to the Modbus TCP Card.

#### EMC Precautions

To minimise electromagnetic interference, Ethernet cables should be separated from motor and mains cables by 200 mm.

If the Ethernet cable must cross motor or mains cables, the crossing should be at an angle of 90°.

### 3.3 Enabling Network Control

The soft starter will only accept commands from the Modbus TCP Card if parameter 1A *Command Source* is set to 'Network'.



#### NOTE

If the reset input is active, the starter will not operate. If a reset switch is not required, fit a link across terminals 10, 11 on the soft starter.

### 3.4 Network Establishment

The controller must establish communications directly with each device before the device can participate in the network.

### 3.5 Addressing

Each device in a network is addressed using a MAC address and an IP address, and can be assigned a symbolic name associated with the MAC address.

- The device can be assigned a static IP address during configuration, or can be configured to accept a dynamic IP address (via DHCP).
- The symbolic name is optional and must be configured within the device.
- The MAC address is fixed within the device and is printed on a label on the front of the module.

## 4 Device Configuration

Network communication parameters for the card must be set via the soft starter.



#### NOTE

The Error LED flashes whenever the device is receiving power but is not connected to a network. The Error LED will flash throughout the configuration process.

Parameter	Parameter name	Default
11H	<i>Gateway Address</i>	192
11I	<i>Gateway Address 2</i>	168
11J	<i>Gateway Address 3</i>	0
11K	<i>Gateway Address 4</i>	100
11L	<i>IP Address</i>	192
11M	<i>IP Address 2</i>	198
11N	<i>IP Address 3</i>	0
11O	<i>IP Address 4</i>	2
11P	<i>Subnet Mask</i>	255
11Q	<i>Subnet Mask 2</i>	255
11R	<i>Subnet Mask 3</i>	255
11S	<i>Subnet Mask 4</i>	0
11T	<i>DHCP</i>	Disable
11U	<i>Location ID</i>	0



#### NOTE

The Modbus TCP Card also supports DHCP addressing.

## 5 Operation

The Modbus TCP Card must be controlled by a Modbus client (such as a PLC) which complies with the Modbus Protocol Specification. For successful operation, the client must also support all functions and interfaces described in this document.

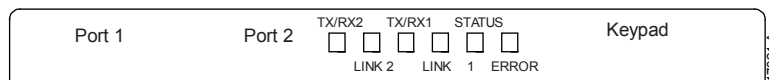
### 5.1 Device Classification

The Modbus TCP Module is a Modbus server and must be managed by a Modbus client over Ethernet.

### 5.2 Configuration

The Modbus TCP Module must be configured directly in the PLC. No additional files are required.

### 5.3 Feedback LEDs



LED name	LED Status	Description
Error	Off	No error.
	Flashing	System error.
	On	Communication error.
Status	Off	Device is not powered up.
	Slow flash	Ready but not configured.
	Fast flash	Communication has been established.
Link x	Off	No network connection.
	On	Connected to a network.
TX/RX x	Flashing	Operating normally.
	Off	No network connection.

## 6 Modbus Registers



### NOTE

All references to registers mean the registers within the module unless otherwise stated.

### 6.1 Compatibility

The Modbus TCP Card supports two modes of operation.

- In Standard Mode, the device uses registers defined in the Modbus Protocol Specification.
- In Legacy Mode, the device uses the same registers as WorldWide Electric's Modbus device. Some registers differ from those specified in the Modbus Protocol Specification.

The mode of operation is determined by the values of bit 15 in register 40001.

- Standard Mode: set Bit 15 = 1. Bits 0~7 of register 40001 are used for command.
- Legacy Mode: set Bit 15 = 0. The remaining bits of register 40001 are reserved.

#### Examples

10000000 00000001 = start the motor (Standard Mode).

10000000 00000000 = stop the motor (Standard Mode).

00000000 xxxxxxxx = switch to Legacy Mode. The device will ignore the remaining bits in register 40001 and will check the value in register 40002.

### 6.2 Ensuring Safe and Successful Control

Data written to the Ethernet/IP Card will remain in its registers until the data is overwritten or the device is reinitialised.

If the soft starter may be controlled via Command Override (parameter 7A) or may be disabled via the reset input (terminals 10, 11) fieldbus commands should be cleared from the registers. If a command is not cleared, it will be re-sent to the starter once fieldbus control resumes.

### 6.3 Configuring Soft Starter Parameters

Parameter management is always multiple write of the entire parameter block.

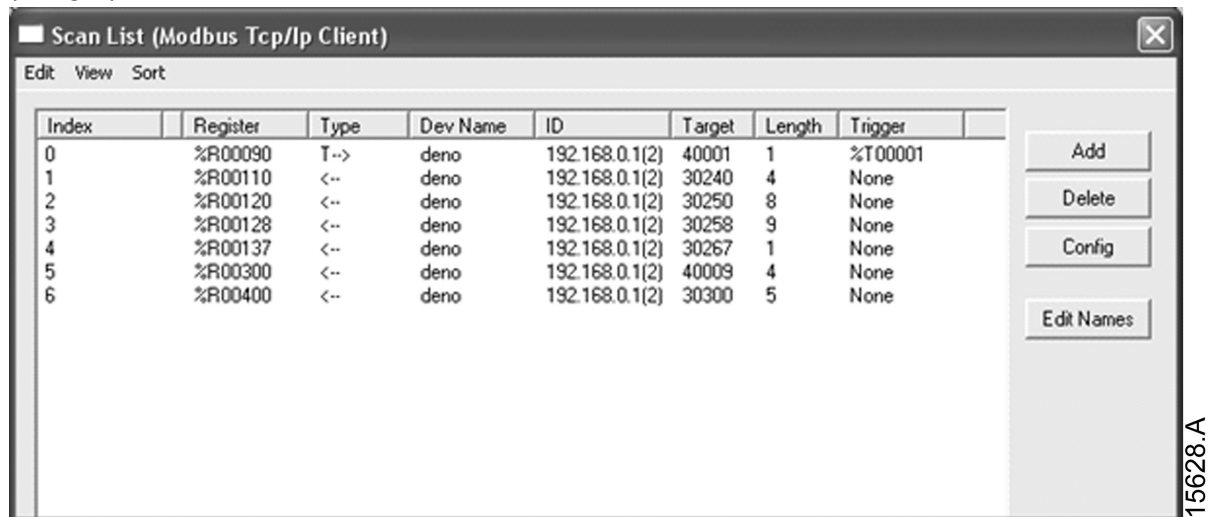
When configuring parameters in the soft starter, the PLC must be programmed with the correct values for all parameters. The Modbus TCP Card will update every parameter in the starter to match the values in the PLC.

### 6.4 Standard Mode

#### PLC Configuration

The PLC must be configured to map registers within the module to addresses within the PLC.

Example mapping of PLC registers to registers within the Modbus TCP Card (Target):



**Command and Configuration Registers (Read/Write)**

Register	Description	Bits	Details
40001	Command (single write)	0 to 7	To send a command to the starter, write the required value: 00000000 = Stop 00000001 = Start 00000010 = Reset 00000100 = Quick stop (coast to stop) 00001000 = Forced communication trip 00010000 = Start using Parameter Set 1 <sup>1</sup> 00100000 = Start using Parameter Set 2 <sup>1</sup> 01000000 = <i>Reserved</i> 10000000 = <i>Reserved</i>
		8 to 14	<i>Reserved</i>
		15	Must = 1
40002	<i>Reserved</i>	0 to 7	
40003	<i>Reserved</i>	0 to 7	
40004	<i>Reserved</i>	0 to 7	
40005	<i>Reserved</i>	0 to 7	
40006	<i>Reserved</i>	0 to 7	
40007	<i>Reserved</i>	0 to 7	
40008	<i>Reserved</i>	0 to 7	
40009 <sup>2</sup>	Parameter management (single/multiple read or multiple write)	0 to 7	Manage soft starter programmable parameters

<sup>1</sup> Ensure that the programmable input is not set to Motor Set Select before using this function.

<sup>2</sup> Refer to *Parameter Lists* on page 16 for a complete parameter list. The first product parameter is always allocated to register 40009. The last product parameter is allocated to register 40XXX, where XXX = 008 plus total number of available parameters in the product. The Modbus TCP Card can read or write a maximum of 125 registers in one operation. These registers support multiple write (Modbus function code 16). Attempting to write to a single register will return an error code 01 (Illegal function code).

### Status Reporting Registers (Read Only)



#### NOTE

Jog is only available with WSIQ.

Register	Description	Bits	Details
30003	Starter state	0 to 3	1 = Ready 2 = Starting 3 = Running 4 = Stopping (including braking) 5 = Restart delay (including temperature check) 6 = Tripped 7 = Programming mode 8 = Jog forward 9 = Jog reverse
		4	1 = Positive phase sequence (only valid if bit 6 = 1)
		5	1 = Current exceeds FLC
		6	0 = Uninitialised 1 = Initialised
		7	<i>Reserved</i>
30004 <sup>1</sup>	Trip code	0 to 7	Refer to <i>Trip Codes</i> on page 14
30005 <sup>2</sup>	Motor current	0 to 7	Average 3-phase motor current (A)
30006	Motor temperature	0 to 7	Motor thermal model (%)
30007	Product information		<i>Reserved</i>
30008	Serial Protocol Version		<i>Reserved</i>
30600	Version	0 to 5	Binary protocol version
		6 to 8	Parameter list major version
		9 to 15	Product type code
30601	<i>Reserved</i>		
30602	<i>Reserved</i>		
30603	<i>Reserved</i>		



Register	Description	Bits	Details
30604	Starter state	0 to 4	0 = <i>Reserved</i> 1 = Ready 2 = Starting 3 = Running 4 = Stopping 5 = Not ready (restart delay, restart temperature check, run simulation, reset input is open) 6 = Tripped 7 = Programming mode 8 = Jog forward 9 = Jog reverse
		5	1 = Warning
		6	0 = Unintialised 1 = Initialised
		7	Command source 0 = Remote Keypad, Digital Input, Clock 1 = Network, Smart Card, Smart Card + Clock
		8	<i>Reserved</i>
		9	0 = Negative phase sequence 1 = Positive phase sequence
		10 to 15	<i>Reserved</i>
30605 <sup>2</sup>	Current	0 to 13	Average rms current across all three phases
		14 to 15	<i>Reserved</i>
30606	Current	0 to 9	Current (% motor FLC)
		10 to 15	<i>Reserved</i>
30607	Motor temperature	0 to 7	Motor thermal model (%)
		8 to 15	<i>Reserved</i>
30608	<i>Reserved</i>		
30609	% Power factor	0 to 7	100% = power factor of 1
		8 to 15	<i>Reserved</i>
30610	<i>Reserved</i>		
30611 <sup>2</sup>	Current	0 to 13	Phase 1 current (rms)
		14 to 15	<i>Reserved</i>
30612 <sup>2</sup>	Current	0 to 13	Phase 2 current (rms)
		14 to 15	<i>Reserved</i>
30613 <sup>2</sup>	Current	0 to 13	Phase 3 current (rms)
		14 to 15	<i>Reserved</i>

Register	Description	Bits	Details
30614	<i>Reserved</i>		
30615	<i>Reserved</i>		
30616	<i>Reserved</i>		
30617	Parameter list version number	0 to 7	Parameter list minor revision
		8 to 15	Parameter list major version
30618	Digital Input state	0 to 15	For all inputs, 0 = open, 1 = closed (shorted) 0 = Start/Stop 1 = <i>Reserved</i> 2 = Reset 3 = Input A 4 = Input B 5 to 15 = <i>Reserved</i>
30619 <sup>1</sup>	Trip code	0 to 7	Refer to <i>Trip Codes</i> on page 14
		8 to 15	<i>Reserved</i>
30620~ 30631	<i>Reserved</i>		

<sup>1</sup> Bits 10~15 of register 30614 report the soft starter's trip or warning code. If the value of bits 0~4 is 6, the soft starter has tripped. If bit 5 = 1, a warning has activated and the starter is continuing to operate.

<sup>2</sup> For models WSx-0064BP and smaller this value will be 10 times greater than the value displayed on the keypad.

<sup>3</sup> Product type code:

12 = WSB

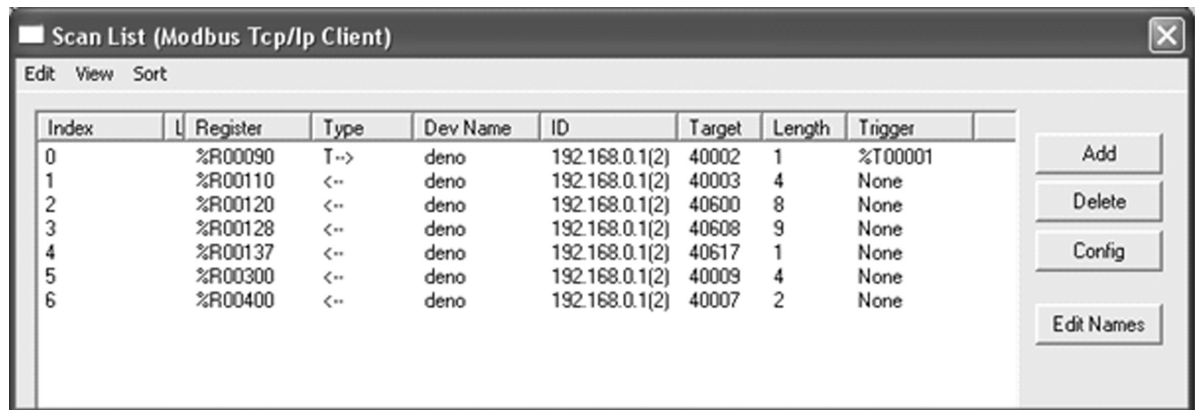
13 = WSIQ

## 6.5 Legacy Mode

### PLC Configuration

The PLC must be configured to map registers within the module to addresses within the PLC.

*Example mapping of PLC registers to registers within the Modbus TCP Card (Target):*



15624.A

### Registers

Register	Description	Bits	Details
40001	<i>Reserved</i>	0 to 14	<i>Reserved</i>
		15	Must be zero
40002	Command (single write)	0 to 2	To send a command to the starter, write the required value: 1 = Start 2 = Stop 3 = Reset 4 = Quick stop (coast to stop) 5 = Forced communication trip 6 = Start using Parameter Set 1 7 = Start using Parameter Set 2
		3 to 7	<i>Reserved</i>
40003	Starter state	0 to 3	1 = Ready 2 = Starting 3 = Running 4 = Stopping (including braking) 5 = Restart delay (including temperature check) 6 = Tripped 7 = Programming mode 8 = Jog forward 9 = Jog reverse
		4	1 = Positive phase sequence (only valid if bit 6 = 1)
		5	1 = Current exceeds FLC

Register	Description	Bits	Details
		6	0 = Uninitialised 1 = Initialised
		7	<i>Reserved</i>
40004	<i>Reserved</i>		
40005 <sup>1</sup>	Motor current	0 to 7	Average 3-phase motor current (A)
40006	Motor temperature	0 to 7	Motor thermal model (%)
40007	<i>Reserved</i>		
40008	<i>Reserved</i>		
40009 <sup>3</sup> ~ 40200	Parameter management (single/multiple read or multiple write)	0 to 7	Manage soft starter programmable parameters
40600	Version	0 to 5	Binary protocol version
		6 to 8	Parameter list version number
		9 to 15	Product type code <sup>2</sup>
40601	<i>Reserved</i>		
40602	<i>Reserved</i>		
40603	<i>Reserved</i>		
40604	Starter state	0 to 4	0 = <i>Reserved</i> 1 = Ready 2 = Starting 3 = Running 4 = Stopping 5 = Not ready (restart delay, restart temperature check, run simulation, reset input is open) 6 = Tripped 7 = Programming mode 8 = Jog forward 9 = Jog reverse
		5	1 = Warning
		6	0 = Uninitialised 1 = Initialised
		7	Command source 0 = Remote Keypad, Digital Input, Clock 1 = Network, Smart Card, Smart Card + Clock
		8	<i>Reserved</i>
		9	1 = Positive phase sequence
		10 to 15	<i>Reserved</i>

Register	Description	Bits	Details
40605 <sup>1</sup>	Current	0 to 13	Average rms current across all three phases
		14 to 15	<i>Reserved</i>
40606	Current	0 to 9	Current (% motor FLC)
		10 to 15	<i>Reserved</i>
40607	Motor temperature	0 to 7	Motor thermal model (%)
		8 to 15	<i>Reserved</i>
40608	<i>Reserved</i>		
40609	% Power factor	0 to 7	100% = power factor of 1
		8 to 15	<i>Reserved</i>
40610	<i>Reserved</i>		
40611 <sup>1</sup>	Current	0 to 13	Phase 1 current (rms)
		14 to 15	<i>Reserved</i>
40612 <sup>1</sup>	Current	0 to 13	Phase 2 current (rms)
		14 to 15	<i>Reserved</i>
40613 <sup>1</sup>	Current	0 to 13	Phase 3 current (rms)
		14 to 15	<i>Reserved</i>
40614	<i>Reserved</i>		
40615	<i>Reserved</i>		
40616	<i>Reserved</i>		
40617	Parameter list version number	0 to 7	Parameter list minor revision
		8 to 15	Parameter list major version
40618	Digital Input state	0 to 15	For all inputs, 0 = open, 1 = closed (shorted) 0 = Start/Stop 1 = <i>Reserved</i> 2 = Reset 3 = Input A 4 = Input B
40619	Trip code		Refer to <i>Trip Codes</i> on page 14
40620~ 40631	<i>Reserved</i>		

<sup>1</sup> For models WSx-0064BP and smaller this value will be 10 times greater than the value displayed on the keypad.

<sup>2</sup> Product type code:

12 = WSB

13 = WSIQ

<sup>3</sup> Refer to *Parameter Lists* on page 16 for a complete parameter list. The first product parameter is always allocated to register 40009. The last product parameter is allocated to register 40XXX, where XXX = 008 plus total number of available parameters in the product. The Modbus TCP Card can read or write a maximum of

125 registers in one operation. These registers support multiple write (Modbus function code 16). Attempting to write to a single register will return an error code 01 (Illegal function code).

## 6.6 Trip Codes

Trip Code	Description
1	Excess start time
2	Motor overload
3	Motor thermistor
4	Current imbalance
5	Frequency
6	Phase sequence
7	Instantaneous overcurrent
8	Power loss
9	Undercurrent
10	Heatsink overtemperature
11	Motor connection
12	Input A trip
13	FLC too high
14	Unsupported option (function not available in inside delta)
15	Starter communication (between device and soft starter)
16	Network communication (between device and network)
17	Internal fault x (where x is the fault code detailed in the table below)
23	Parameter out of range
24	Input B trip
26	L1 phase loss
27	L2 phase loss
28	L3 phase loss
29	L1-T1 shorted
30	L2-T2 shorted
31	L3-T3 shorted
33	Time-overcurrent (Bypass overload)
34	SCR overtemperature
35	Battery/clock
36	Thermistor circuit
49	Low Control Volts
56	Keypad disconnected
57	Zero Speed Detect
58	SCR Itsm
59	Instantaneous overcurrent
60	Rating Capacity

**Internal Fault X**

The table below details the internal fault code associated with trip code 17.

<b>Internal fault</b>	<b>Message displayed on the keypad</b>
70 ~ 72	Current Read Err Lx
73	ATTENTION! Remove Mains Volts
74 ~ 76	Motor Connection Tx
77 ~ 79	Firing Fail Px
80 ~ 82	VZC Fail Px
83	Low Control Volts
84 ~ 98	Internal fault X Contact your local supplier with the fault code (X).

## 6.7 Parameter Lists

### WSIQ

	Parameter name
1	Command Source
2	Motor Full Load Current
3	Locked Rotor Time
4	Locked Rotor Current
5	Motor Service Factor
6	Start Mode
7	Start Ramp Time
8	Initial Current
9	Current Limit
10	Adaptive Start Profile
11	Kickstart Time
12	Kickstart Level
13	Jog Torque
14	Stop Mode
15	Stop Time
16	Adaptive Stop Profile
17	Adaptive Control Gain
18	Multi Pump
19	Start Delay
20	DC Brake Torque
21	DC Brake Time
22	Brake Current Limit
23	Soft Brake Delay
24	Start Mode-2
25	Start Ramp Time-2
26	Initial Current-2
27	Current Limit-2
28	Adaptive Start Profile-2
29	Kickstart Time-2
30	Kickstart Level-2
31	Jog Torque-2
32	Stop Mode-2
33	Stop Time-2
34	Adaptive Stop Profile-2
35	Adaptive Control Gain-2
36	Multi Pump-2
37	Start Delay-2

	Parameter name
100	Input B Trip
101	Input B Trip Delay
102	Input B Initial Delay
103	Reset/Enable Logic
104	Input A Name
105	Input B Name
106	Relay A Function
107	Relay A On Delay
108	Relay A Off Delay
109	Relay B Function
110	Relay B On Delay
111	Relay B Off Delay
112	Low Current Flag
113	High Current Flag
114	Motor Temperature Flag
115	Main Contactor Time
116	Analog Output A
117	Analog A Scale
118	Analog A Maximum Adjustment
119	Analog A Minimum Adjustment
120	Language
121	Temperature Scale
122	Graph Timebase
123	Graph Maximum Adjustment
124	Graph Minimum Adjustment
125	Current Calibration
126	Adjustment Lock
127	User Parameter 1
128	User Parameter 2
129	Modbus Address
130	Modbus Baud Rate
131	Modbus Parity
132	Modbus Timeout
133	Devicenet Address
134	Devicenet Baud Rate
135	Profibus Address
136	Gateway Address



	Parameter name
38	<i>DC Brake Torque-2</i>
39	<i>DC Brake Time-2</i>
40	<i>Brake Current Limit-2</i>
41	<i>Soft Brake Delay-2</i>
42	<i>Auto-Start/Stop Mode</i>
43	<i>Sunday Mode</i>
44	<i>Sunday Start Time</i>
45	<i>Sunday Stop Time</i>
46	<i>Monday Mode</i>
47	<i>Monday Start Time</i>
48	<i>Monday Stop Time</i>
49	<i>Tuesday Mode</i>
50	<i>Tuesday Start Time</i>
51	<i>Tuesday Stop Time</i>
52	<i>Wednesday Mode</i>
53	<i>Wednesday Start Time</i>
54	<i>Wednesday Stop Time</i>
55	<i>Thursday Mode</i>
56	<i>Thursday Start Time</i>
57	<i>Thursday Stop Time</i>
58	<i>Friday Mode</i>
59	<i>Friday Start Time</i>
60	<i>Friday Stop Time</i>
61	<i>Saturday Mode</i>
62	<i>Saturday Start Time</i>
63	<i>Saturday Stop Time</i>
64	<i>Current Imbalance</i>
65	<i>Current Imbalance Delay</i>
66	<i>Undercurrent</i>
67	<i>Undercurrent Delay</i>
68	<i>Overcurrent</i>
69	<i>Overcurrent Delay</i>
70	<i>Excess Start Time</i>
71	<i>Restart Delay</i>
72	<i>Current Imbalance</i>
73	<i>Undercurrent</i>
74	<i>Overcurrent</i>
75	<i>Excess Start Time</i>
76	<i>Input A Trip</i>
77	<i>Input B Trip</i>

	Parameter name
137	<i>Gateway Address 2</i>
138	<i>Gateway Address 3</i>
139	<i>Gateway Address 4</i>
140	<i>IP Address</i>
141	<i>IP Address 2</i>
142	<i>IP Address 3</i>
143	<i>IP Address 4</i>
144	<i>Subnet Mask</i>
145	<i>Subnet Mask 2</i>
146	<i>Subnet Mask 3</i>
147	<i>Subnet Mask 4</i>
148	<i>DHCP</i>
149	<i>Location ID</i>
150	<i>Auto-Reset Count</i>
151	<i>Auto-Reset Delay</i>
152	<i>Pressure Sensor Type</i>
153	<i>Pressure Units</i>
154	<i>Pressure at 4 mA</i>
155	<i>Pressure at 20 mA</i>
156	<i>Flow Sensor Type</i>
157	<i>Flow Units</i>
158	<i>Flow at 4 mA</i>
159	<i>Flow at 20 mA</i>
160	<i>Units per Minute at Max Flow</i>
161	<i>Pulses per Minute at Max Flow</i>
162	<i>Units per Pulse</i>
163	<i>Depth Sensor Type</i>
164	<i>Depth Units</i>
165	<i>Depth at 4 mA</i>
166	<i>Depth at 20 mA</i>
167	<i>High Flow Trip Level</i>
168	<i>Low Flow Trip Level</i>
169	<i>Flow Start Delay</i>
170	<i>Flow Response Delay</i>
171	<i>High Pressure Trip Level</i>
172	<i>High Pressure Start Delay</i>
173	<i>High Pressure Response Delay</i>
174	<i>Low Pressure Trip Level</i>
175	<i>Low Pressure Start Delay</i>
176	<i>Low Pressure Response Delay</i>

	<b>Parameter name</b>
78	<i>Network Communications</i>
79	<i>Remote Keypad Fault</i>
80	<i>Frequency</i>
81	<i>Motor Overtemperature</i>
82	<i>Motor Thermistor Circuit</i>
83	<i>Shorted SCR Action</i>
84	<i>Battery/Clock</i>
85	<i>Pressure Sensor</i>
86	<i>Flow Sensor</i>
87	<i>Depth Sensor</i>
88	<i>High Pressure</i>
89	<i>Low Pressure</i>
90	<i>High Flow</i>
91	<i>Low Flow</i>
92	<i>Flow Switch</i>
93	<i>Well Depth</i>
94	<i>RTD/PT100 B</i>
95	<i>Input A Function</i>
96	<i>Input A Trip</i>
97	<i>Input A Trip Delay</i>
98	<i>Input A Initial Delay</i>
99	<i>Input B Function</i>

	<b>Parameter name</b>
177	<i>Pressure Control Mode</i>
178	<i>Start Pressure Level</i>
179	<i>Start Response Delay</i>
180	<i>Stop Pressure Level</i>
181	<i>Stop Response Delay</i>
182	<i>Depth Trip Level</i>
183	<i>Depth Reset Level</i>
184	<i>Depth Start Delay</i>
185	<i>Depth Response Delay</i>
186	<i>Temperature Sensor Type</i>
187	<i>Temperature Trip Level</i>
188	<i>Tracking Gain</i>
189	<i>Pedestal Detect</i>
190	<i>Bypass Contactor Delay</i>
191	<i>Model Rating</i>
192	<i>Screen Timeout</i>

## WSB

	Parameter name
1	Command Source
2	Motor Full Load Current
3	Locked Rotor Time
4	Locked Rotor Current
5	Motor Service Factor
6	Start Mode
7	Start Ramp Time
8	Initial Current
9	Current Limit
10	Adaptive Start Profile
11	Stop Mode
12	Stop Time
13	Adaptive Stop Profile
14	Adaptive Control Gain
15	Multi Pump
16	Start Delay
17	Current Imbalance
18	Current Imbalance Delay
19	Undercurrent
20	Undercurrent Delay
21	Overcurrent
22	Overcurrent Delay
23	Excess Start Time
24	Restart Delay
25	Current Imbalance
26	Undercurrent
27	Overcurrent
28	Excess Start Time
29	Input A Trip
30	Input B Trip
31	Network Communications
32	Remote Keypad Fault
33	Frequency
34	Motor Overtemperature
35	Motor Thermistor Circuit
36	Pressure Sensor
37	Flow Sensor
348	Depth Sensor

	Parameter name
100	Location ID
101	Auto-Reset Count
102	Auto-Reset Delay
103	Pressure Sensor Type
104	Pressure Units
105	Pressure at 4 mA
106	Pressure at 20 mA
107	Flow Sensor Type
108	Flow Units
109	Flow at 4 mA
110	Flow at 20 mA
111	Units per Minute at Max Flow
112	Pulses per Minute at Max Flow
113	Units per Pulse
114	Depth Sensor Type
115	Depth Units
116	Depth at 4 mA
117	Depth at 20 mA
118	High Flow Trip Level
119	Low Flow Trip Level
120	Flow Start Delay
121	Flow Response Delay
122	High Pressure Trip Level
123	High Pressure Start Delay
124	High Pressure Response Delay
125	Low Pressure Trip Level
126	Low Pressure Start Delay
127	Low Pressure Response Delay
128	Pressure Control Mode
129	Start Pressure Level
130	Start Response Delay
131	Stop Pressure Level
132	Stop Response Delay
133	Depth Trip Level
134	Depth Reset Level
135	Depth Start Delay
136	Depth Response Delay
137	Temperature Sensor Type

	<b>Parameter name</b>
39	<i>High Pressure</i>
40	<i>Low Pressure</i>
41	<i>High Flow</i>
42	<i>Low Flow</i>
43	<i>Flow Switch</i>
44	<i>Well Depth</i>
45	<i>RTD/PT100 B</i>
46	<i>Input A Function</i>
47	<i>Input A Trip</i>
48	<i>Input A Trip Delay</i>
49	<i>Input A Initial Delay</i>
50	<i>Input B Function</i>
51	<i>Input B Trip</i>
52	<i>Input B Trip Delay</i>
53	<i>Input B Initial Delay</i>
54	<i>Reset/Enable Logic</i>
55	<i>Input A Name</i>
56	<i>Input B Name</i>
57	<i>Relay A Function</i>
58	<i>Relay A On Delay</i>
59	<i>Relay A Off Delay</i>
60	<i>Relay B Function</i>
61	<i>Relay B On Delay</i>
62	<i>Relay B Off Delay</i>
63	<i>Low Current Flag</i>
64	<i>High Current Flag</i>
65	<i>Motor Temperature Flag</i>
66	<i>Main Contactor Time</i>
67	<i>Analog Output A</i>
68	<i>Analog A Scale</i>
69	<i>Analog A Maximum Adjustment</i>
70	<i>Analog A Minimum Adjustment</i>
71	<i>Language</i>
72	<i>Temperature Scale</i>
73	<i>Graph Timebase</i>
74	<i>Graph Maximum Adjustment</i>
75	<i>Graph Minimum Adjustment</i>
76	<i>Current Calibration</i>
77	<i>Adjustment Lock</i>
78	<i>User Parameter 1</i>

	<b>Parameter name</b>
138	<i>Temperature Trip Level</i>
139	<i>Tracking Gain</i>
140	<i>Pedestal Detect</i>
141	<i>Bypass Contactor Delay</i>
142	<i>Model Rating</i>
143	<i>Screen Timeout</i>

	Parameter name
79	<i>User Parameter 2</i>
80	<i>Modbus Address</i>
81	<i>Modbus Baud Rate</i>
82	<i>Modbus Parity</i>
83	<i>Modbus Timeout</i>
84	<i>Devicenet Address</i>
85	<i>Devicenet Baud Rate</i>
86	<i>Profibus Address</i>
87	<i>Gateway Address</i>
88	<i>Gateway Address 2</i>
89	<i>Gateway Address 3</i>
90	<i>Gateway Address 4</i>
91	<i>IP Address</i>
92	<i>IP Address 2</i>
93	<i>IP Address 3</i>
94	<i>IP Address 4</i>
95	<i>Subnet Mask</i>
96	<i>Subnet Mask 2</i>
97	<i>Subnet Mask 3</i>
98	<i>Subnet Mask 4</i>
99	<i>DHCP</i>

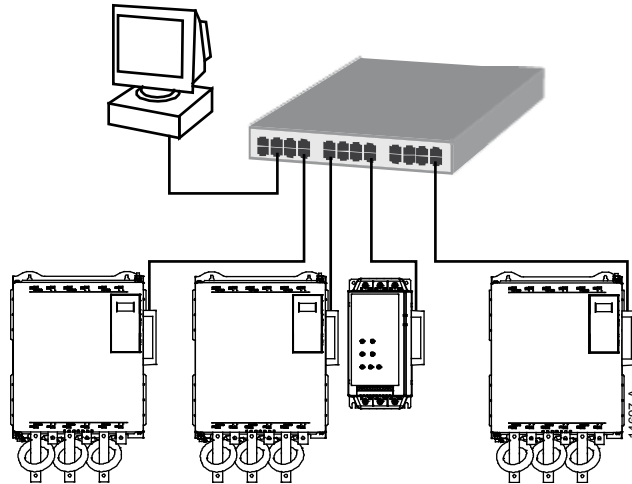
	Parameter name
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## 7 Network Design

The Modbus TCP Card supports star, line and ring topologies.

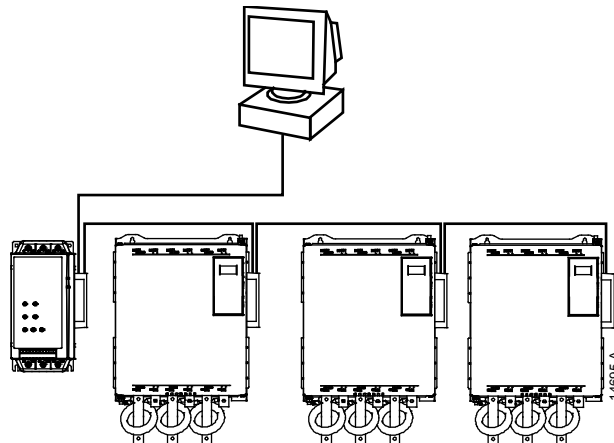
### 7.1 Star Topology

In a star network, all controllers and devices connect to a central network switch.



### 7.2 Line Topology

In a line network, the controller connects directly to one port of the first Modbus TCP Card. The second Ethernet port of the Modbus TCP Card connects to another module, which in turn connects to another module until all devices are connected.



#### NOTE

The Modbus TCP Card has an integrated switch to allow data to pass through in line topology. The Modbus TCP Card must be receiving control power from the soft starter for the switch to operate.



#### NOTE

If the connection between two devices is interrupted, the controller cannot communicate with devices after the interruption point.



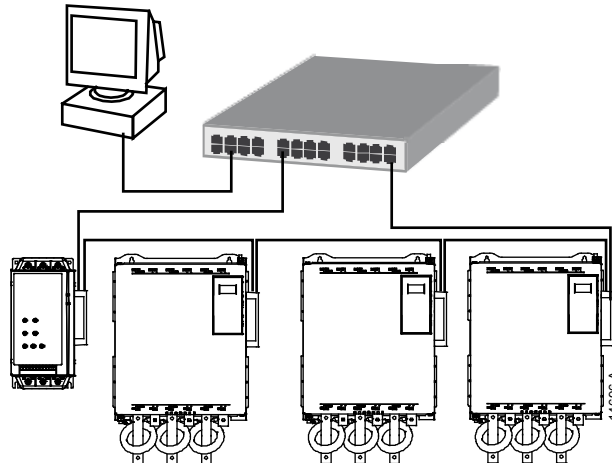
#### NOTE

Each connection adds a delay to communication with the next module. The maximum number of devices in a line network is 32. Exceeding this number may reduce the reliability of the network.

### 7.3 Ring Topology

In a ring topology network, the controller connects to the first Modbus TCP Card, via a network switch. The second Ethernet port of the Modbus TCP Card connects to another device, which in turn connects to another device until all devices are connected. The final device connects back to the switch.

The Modbus TCP Card supports beacon based ring node configuration.

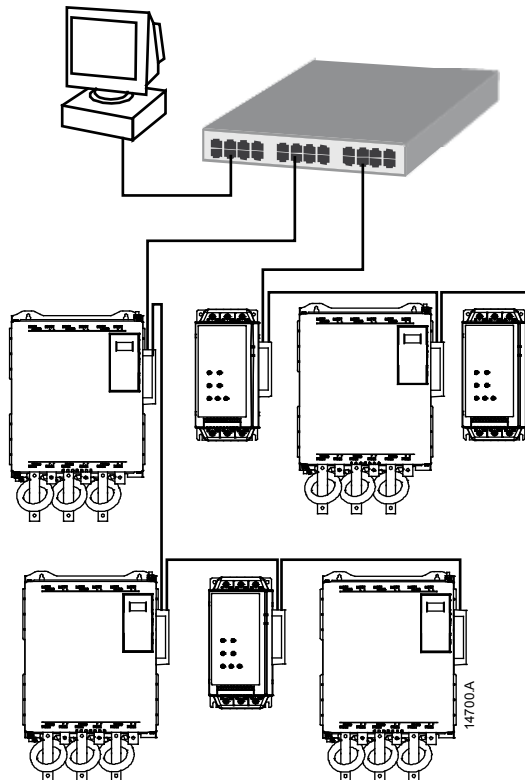


**NOTE**

The network switch must support loss of line detection.

### 7.4 Combined Topologies

A single network can include both star and line components.



## 8 Specifications

### Connections

Soft starter .....	6-way pin assembly
Contacts .....	Gold flash
Network .....	RJ45

### Settings

IP address .....	Automatically assigned, configurable
Device name .....	Automatically assigned, configurable

### Network

Link speed .....	10 Mbps, 100 Mbps (auto-detect)
Full duplex	
Auto crossover	

### Power

Consumption (steady state, maximum) .....	35 mA @ 24 VDC
Reverse polarity protected	
Galvanically isolated	

### Certification

CE .....	EN 60947-4-2
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